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Houston, Texas 77058

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OPERATION PLAN
FOR THE
HIGH DENSITY TAPE/LANDSAT IMAGERY
VERIFICATION AND EXTRACTION SYSTEM
(HDT/LIVES)
DATA PROCESSING SUPPORT

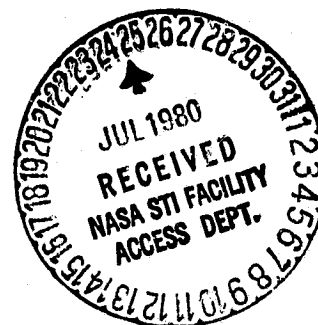
(E80-10322) OPERATION PLAN FOR THE HIGH
DENSITY TAPE/LANDSAT IMAGERY VERIFICATION
AND EXTRACTION SYSTEM (HDT/LIVES) DATA
PROCESSING SUPPORT (Lockheed Engineering and
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Prepared By
Lockheed Engineering and Management Services Company, Inc.
Systems and Services Division
Houston, Texas

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FOR THE
HIGH DENSITY TAPE/LANDSAT IMAGERY
VERIFICATION AND EXTRACTION SYSTEM
(HDT/LIVES)
DATA PROCESSING SUPPORT

Job Order 76-632

Prepared By

A. J. Bowen, Jr.

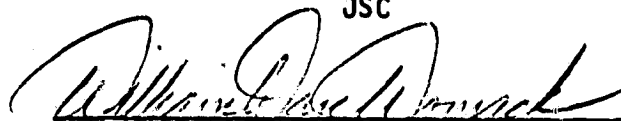
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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HOUSTON, TEXAS 77058

June 1980

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1.0 PURPOSE

This document depicts the plan for processing and availability of Landsat data for 1980 in support of the AgRISTARS project.

2.0 SCOPE

This plan encompasses the activities that are principally performed within the operational flow of Landsat data processing support. The functional aspects of this activity are performed by the Data Management and Operations support elements. This data flow covers data ordering, data receiving, data scheduling, data pre-processing, data archiving, and data base management.

3.0 DOCUMENT REFERENCES

Acceptance Test Specification of the Landsat Imagery Verification and Extraction System (LIVES), January 1980, JSC-14635, LEMSCO-12900.

"As-Built" Design Specifications of the Landsat Imagery Verification and Extraction System (LIVES), December 1979, JSC-14634, LEC-12904.

Operations Manual for the Landsat Imagery Verification and Extraction System (LIVES), March 1979, JSC-14633, LEC-12903.

Users Manual for the Landsat Imagery Verification and Extraction System (LIVES), August 1979, JSC-14632, LEC-12902.

Domestic Satellite (DOMSAT) Data Link, January 1980, JSC-16410, LEMSCO-14334.

Quad System Incorporated (QSI) Operating Procedures and Responsibilities, January 1980, JSC-16408, LEMSCO-14332.

High Density Tape Processing System, January 1980, JSC-16414, LEMSCO-14354.

4.0 INTRODUCTION

This document describes various processes, practices, and procedures which are currently in effect for the support of Landsat data processing. In some cases procedural information has been formally documented and published. In other regards this has not occurred. It is in these areas that attention should be given, to ensure availability of documentation.

The support discussed in this plan is provided by distinct functional entities (Operations and Data Management Sections). However, for the purpose of this plan the emphasis is placed on data or activity flow rather than function. The generalized data/activity flow is shown in Figure 4.1-1.

The process phases reflected in this document are divided into seven parts, each being discussed in a separate section. These include the following subjects:

- o Data Order Preparation
- o Data Receipt
- o Production Scheduling
- o Production Processing
- o Data Archival
- o Data Quality Checks
- o Data Base Management

Each of these sections provides a general description of the activity performed. It is not intended to provide specific procedural information in this document.

HDT/LIVES GENERALIZED DATA/ACTIVITY FLOW

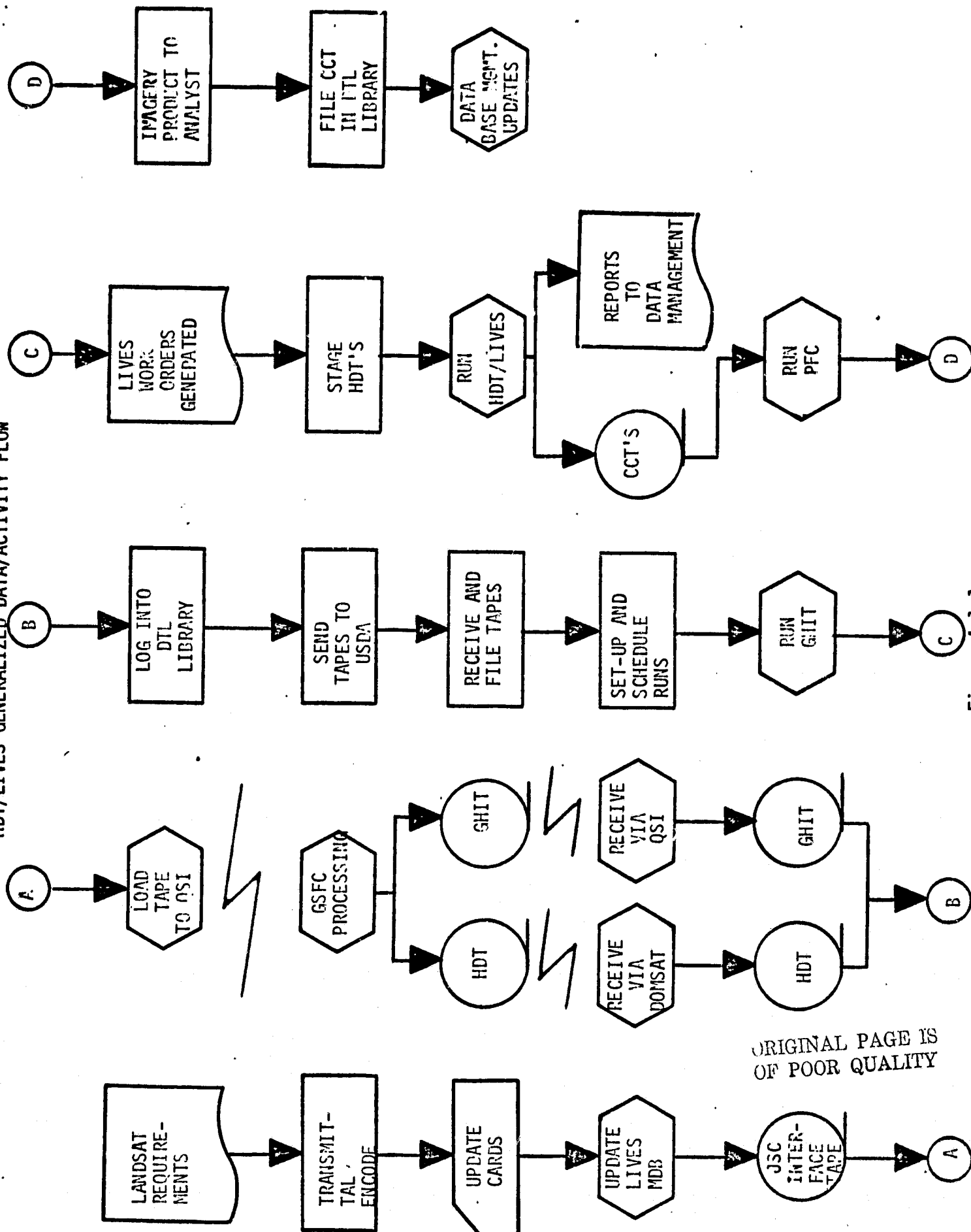


Figure 4.1-1.

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5.0 HARDWARE/SOFTWARE REQUIREMENTS

The accomplishment of the processes and activities that support this plan, require the availability of the following existing hardware and/or software systems or components. These hardware and software elements have all been subjected to acceptance testing.

5.1 HARDWARE SYSTEMS

5.1.1 PDP 11/45 SYSTEM (SUPPORT PROCESSOR)

This system is used for the extraction of selected Areas of Interest (AOI), conditioning the data, and writing computer-compatible tapes (CCT's). Related data bases are maintained on this system.

5.1.2 PDP 11/20 SYSTEM

This system is used to reformat High Density Tape (HDT) data for use on the PDP 11/45 system. The data is read from the DOMSAT tape recorders, reformatted, and placed on the 300 megabyte disks.

5.1.3 DOMESTIC SATELLITE (DOMSAT) TAPE RECORDERS/DATA LINK

These are used to receive the HDT data through the DOMSAT data link. In turn, they are used to input the HDT to the PDP 11/20 System.

5.1.4 QUAD SYSTEMS, INC. (QSI) RECORDER

This system is used for the reception of Goddard HDT Inventory Tape (GHIT) tapes and the transmission of the "JSC Interface Tape" (Data order tape).

5.2 SOFTWARE SYSTEMS

5.2.1 RSX-11 VERSION 6.2

This is the vendor supplied operating system for the PDP 11/45.

5.2.2 RT-11 VERSION 3B

This is the vendor supplied operating system for the PDP 11/20.

5.2.3 HIGH DENSITY TAPE REFORMATTING SYSTEM (HDTRS)

This system is resident on the PDP 11/20 and is used to reformat the HDT data from the physical HDT to the 300 megabyte disk. This reformatting and placement of data, enables the LIVES extraction to begin.

5.2.4 LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM (LIVES)

This application system is comprised of a series of programs or processors which are used to extract and condition data from the HDT's, write selected data to digital tape, provide data base updates, and output reports.

5.2.5 LIVES INFORMATION MANAGEMENT SYSTEM (LIMS)

This system provides the interface capability between the user and the LIVES data bases. It also provides file management for all LIVES files.

5.2.6 LIVES BATCH SUPPORT PROGRAMS

The following list of runs are available for special purpose activities. These are mentioned here for information purposes only and are fully defined in the "As Built" software development documentation.

o RPREAD

o PACK

o RCVY1

o RCVY2

o RCVY3

o AOIADD

o AOIUPD

o AOIDEL

o OLIVES

o WAITR1

o WAITR2

o WAITR3

o WAITR4

o WAITR5

o ORDHDT

o UPDATE33

6.0 DATA ORDER PREPARATION

This section provides for the mechanisms, controls and procedures which allow for accumulation of user requirements, the updating of the LIVES data base, and the creation and transmission of the data order tape.

6.1 USER REQUIREMENTS

All Landsat data requirements are received through SF6 (data acquisition, handling, and processing). It is understood that requests for data are to be accepted through the use of the "standard data set" forms designed and provided for this purpose.

A manual verification of the data location requested is to be performed by Data Management in order to determine whether problems exist, data is currently available already, or additional cost is involved in satisfying the specified requirement. If any of these problems are encountered, they are to be identified for coordination with the user involved.

The schedule established in conjunction with the set-up of an individual crop year requires two (2) weeks preparation time prior to ordering the data and four (4) work days to turn on Landsat. Retro-orders may not be ordered on any basis.

To turn on additional path/rows, one (1) day's preparation is required, with four (4) work days to turn on Landsat. Retro-orders may not be ordered on any basis.

Once all data questions have been solved, keypunch coding sheets will be completed for conversion to a specified punched card format to be processed against the LIVES data base. This also provides the resulting data order tape for transmission to GSFC.

6.2 LIVES DATA BASE

Updating the LIVES Master Data Base (MDB) prior to the generation of a data order tape ("JSC Interface Tape") is to be accomplished through submission of the punched cards defined in 6.3 with a special LIVES Data Request (Figure 6.1-1), for processing. These cards are processed through the runs known as AOIADD, AOIUPD, and/or AOIDEL. The purpose of these runs is to modify the MDB by adding, changing, and/or deleting various Areas of Interest (AOI). A listing is used to verify that each record was processed and that the MDB has been updated.

This process may be done through interactive means as well as through batch process.

6.3 JSC DATA ORDER TAPE

Once all necessary updates to the MDB have been made and verified a special LIVES Data Request is prepared for running the program ORDHDT. This run outputs an intermediate tape which contains the AOI's ordered for EOD requirements.

The construction of the final data order tape ("JSC Interface Tape") is accomplished through a series of steps which allow the incorporation of the USDA orders as well. Through each step, a verification is made to ensure that data order integrity is maintained. Each of these intermediate steps which require equipment processing are identified through the completion and submission of a Data Techniques Laboratory Batch Request Form (Figure 6.1-2). These processes include tape-to-card punching, card listing, card-to-tape loading, and tape listing.

REQUEST NUMBER: _____

LIVES DATA REQUEST

NAME: _____

DATE: _____

HDT NUMBER _____

GHIT NUMBER _____

EXTRACTION _____

G-SCREEN _____

CONDITION _____

CCTGEN _____

DLYRPT _____

ARCUPD _____

START TIME _____

START TIME _____

STOP TIME _____

STOP TIME _____

DISK PACK NUMBER: _____

NUMBER OF AOI _____

DATA MANAGER/DATE

SPECIAL INSTRUCTIONS:

OPERATOR COMMENTS:

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TAPES GENERATED

TAPE TO PFC

TAPE FROM PFC

☐
☐
☐
☐

☐
☐
☐
☐

AOS/DATE

Figure 6.1-1

DATE:	DATA TECHNIQUES LABORATORY, BATCH REQUEST FORM	JOB SEQ.#
NAME/BRANCH/PHONE	SYSTEM (Please check) <input type="checkbox"/> IMAGE <input type="checkbox"/> SUPPORT <input type="checkbox"/> DATA-100 <input type="checkbox"/> HDT <input type="checkbox"/> OTHER <input type="checkbox"/> ON-LINE <input type="checkbox"/> OFF-LINE	
UIC or USERID	INPUT PRODUCT (Please check)	TAPE# DISK#
<input type="checkbox"/> CARDS <input type="checkbox"/> UIC BATCH SAVE <input type="checkbox"/> ASATS (ONLY) TRANSFER TO: (HOUS/LARS) _____ <input type="checkbox"/> DISK <input type="checkbox"/> TAPE <input type="checkbox"/> 800 BPI <input type="checkbox"/> 1600 BPI		
<input type="checkbox"/> CARDS <input type="checkbox"/> LABELS (ASATS) OUTPUT PRODUCT (Please check)		TAPE# DISK#
<input type="checkbox"/> DISK <input type="checkbox"/> TAPE <input type="checkbox"/> 800 BPI <input type="checkbox"/> 1600 BPI <input type="checkbox"/> NO OUTPUT <input type="checkbox"/> LINE PRINTER <input type="checkbox"/> OTHER _____ TRANSFER FROM: (HOUS/LARS) _____		
SPECIAL INSTRUCTIONS or NOTES: _____ _____ _____		
DTL WORK ORDER CONTROL AREA ONLY DATE SEQUENCE NUMBER ASSIGNED: _____		
LARS ASSIGNED TAPE NUMBER: _____	BY: _____	DATE: _____
DATE JOB CLOSED AND ENTERED INTO CONTROL BOOK: _____	BY: _____	
PRODUCTION COORDINATOR AREA ONLY DATE REQUEST RECEIVED: _____		
ACCEPTED BY: _____ (NAME)		
PRIORITY CODE:		
RED (ASAP)	BLUE (DAYS)	BLACK (OVERNITE)
DTL OPERATORS AREA ONLY		
DATE JOB COMPLETED: _____ (MO/DAY/YR) BY: _____ / ____ / ____ (Please initial)		
COMMENTS: _____ <div style="transform: rotate(-15deg); position: absolute; left: 100px; top: -40px;">ORIGINAL PAGE IS OF POOR QUALITY</div> _____ _____ _____		
JOB PICKED UP BY: _____ (Please sign)	DATE: _____ (MO/DAY/YR)	
COMMENTS: _____		

Final tapes generated through this process are labeled as "JSC Interface Tape", "1980 Crop Year", with the current date and time.

Notification is to be made to SF6 when the tape is ready for transmission to GSFC. This is necessary for coordination to occur between JSC and GSFC, via SF6, for scheduling and pre-transmission preparation. Subsequently the "JSC Interface Tape" is forwarded to Operations for same day transmission to GSFC on the QSI data line.

Under normal circumstances, the transmission of a "JSC Interface Tape" will occur at the conclusion of a standard GHIT receiving period. The communication and operating procedures regarding these processes are currently in effect in Operations:

At the conclusion of this activity, the "JSC Interface Tape" is returned to the Data Management area for retention. This tape is held until the next tape is created, at which time the order file will be released. All associated listings and card files are to be retained by Data Management.

7.0 DATA RECEIPT

This section identifies the schedules, activities, and procedures for receiving HDT's and GHIT's.

7.1 RECEIVING HDT'S

The HDT's are received over the DOMSAT data link tape recorders. The reception of these tapes begins on third shift, and generally extends into the day shift period, as required. Preliminarily, the equipment is tested each day to ensure that equipment is set to specifications and proper data integrity. As each tape is received it is appropriately labeled and subsequently logged into the DTL library. These tapes are made available to the USDA for other independent processing and finally returned to the DTL library for storage. Operations notifies the Data Management Section regarding the return of each HDT from the USDA, in order to facilitate production processing.

The communication, equipment testing and operation, and tape handling procedures for Operations, currently exist in published documentation.

7.2 RECEIVING GHIT'S

The GHIT's are received over the QSI data link tape recorder. The reception of these tapes normally occurs during the day shift. As each tape is received it is labeled and logged into the DTL library. These tapes are then made available to the USDA for independent processing and returned to the DTL library for storage. Operations notifies the Data Management Section of the return of these tapes from the USDA in order to facilitate production processing. The communication, operating, and tape handling procedures for Operations, currently exist in published documentation.

8.0 PRODUCTION SCHEDULING

This selection discusses the LIVES run set-up preparation and identifies the scheduled processing periods of LIVES data.

8.1 LIVES SET-UP PREPARATION

Once the GHIT and HDT correlations are made, the determination is made to submit runs that contain a specific number of segments which can be processed within the scheduled time constraints.

Multiple "LIVES Data Request" forms are prepared and submitted to the Operations area. From these forms Operations personnel determine the HDT and GHIT tape requirements. These tapes are obtained from the tape library and staged for use during the next scheduled processing period.

8.2 PROCESSING SCHEDULES

Although deviations may occur on the basis of changing priorities or backlogs, the following schedules have been established as the normally observed LIVES processing periods:

<u>Processor</u>	<u>Start</u>	<u>End</u>
GHIT Loading	1100	1400
All other LIVES Processors	1400	2000

The discussion of the various LIVES processors which are in use during these periods will be found in Section 9.

9.0 HDT/LIVES PRODUCTION PROCESSING

This section discusses the LIVES processors that are used and which result in the output of the LIVES CCT. The sequence of the production runs is also identified. The generalized flow of the HDT/LIVES process is shown in Figure 9.1-1.

9.1 GHIT PROCESSING

This processor loads the GHIT data to the "Process Control and Status" (PC&S) data base which identifies the segments to be processed from the associated HDT's. A report is output from this processor which is used to verify that loading has occurred appropriately. The operating and recovery procedures relating to this processor are currently in use.

9.2 HDT PROCESSING

The following processes normally constitute an uninterrupted run cycle.

9.2.1 HDTRS

This process occurs on the PDP 11/20. The HDT data is read from the DOMSAT recorder through the PDP 11/20, reformatted and placed on the 300 megabyte disks (full scene data base). These disks are used between the PDP 11/20 and the PDP 11/45. Therefore, the LIVES extraction process may occur directly.

9.2.2 LIVES

These processors are usually run sequentially under production conditions.

9.2.2.1 Extract Processor

This processor selects AOI data that has been loaded from the HDT "Full Scene Data Base" and places them in the "PC&S Data Base". The operating and recovery procedures for this processor are currently in use.

HDT/LIVES GENERALIZED FLOW

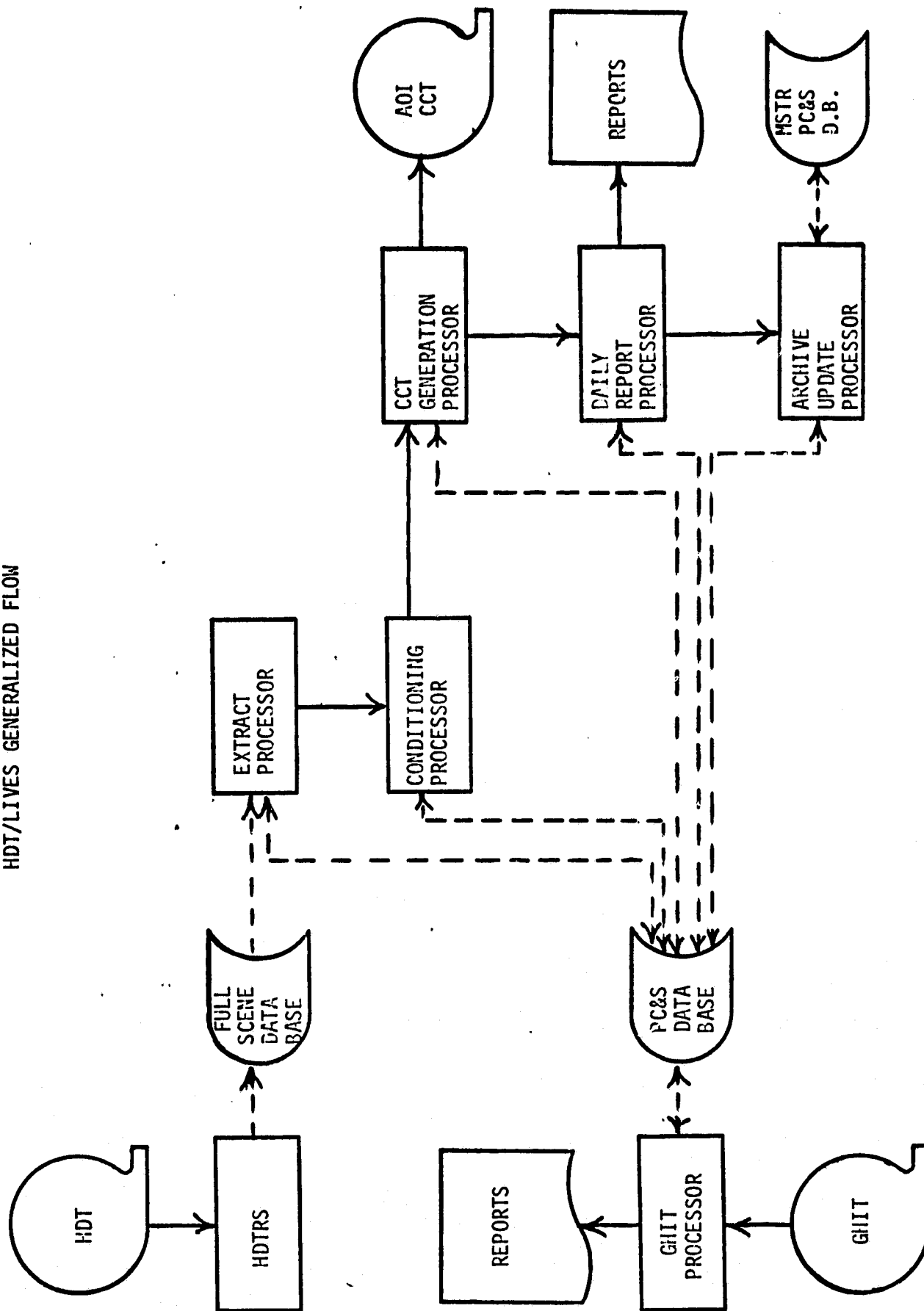


Figure 9.1-1.

9.2.2.2 Conditioning Processor

This processor computes bias and gains for AOI's and is used to delete AOI's based on predetermined parameters for cloud cover percentage in the segment or scene. The operating and recovery procedures for this processor are currently in use.

9.2.2.3 Computer Compatible Tape Generator (CCTGEN) Processor

This processor produces the output tape that contains the AOI's for analysis. A separate tape is generated for each different user ID specified. The operating and recovery procedures for this processor are currently in use.

9.2.2.4 Daily Report Processor

This processor produces the report which describes specific information about each AOI extracted for output to a CCT, for each user ID. The report is reviewed to ensure that expected results have taken place. The operating and recovery procedures for this processor are currently in use.

9.2.2.5 Archive Update Processor

This processor is used at the end of each run cycle to transfer and incorporate the new data in the daily PC&S data base to the Master PC&S data base. This data base contains the history of all LIVES processing since initialization. The operating and recovery procedures for this processor are currently in use.

10.0 DATA ARCHIVAL

This section defines the requirements for HDT, GHIT, and CCT retention and file accountability.

10.1 HDT'S

These tapes will be retained by the DTL Tape Library after processing through LIVES has occurred. Operations will maintain responsibility for the physical integrity of these tapes while they are under retention. File retention will be observed for a minimum of 60 days. However, tapes may not be released without Data Management Section approval.

Any tape that leaves the library for use outside the DTL will be logged out and then logged in upon its return. An accountability file will be maintained for each tape that is on retention, which contains data pertinent to the identification of the data on that tape.

10.2 GHIT'S

These tapes will be retained by the DTL Tape Library, stored, handled, and accounted for on the same basis as described for the HDT's.

10.3 CCT'S

The DTL Tape Library will be responsible for the retention of all CCT's created through LIVES on a permanent basis. It will be necessary to strictly control access to these tapes, especially in those instances where the associated HDT's and GHIT's have been released from retention. An accountability file will be maintained for each CCT, to ensure adequate reporting to users regarding data availability, identification, and location.

11.0 DATA QUALITY CHECKS

This section provides for verifying the data quality of the LIVES produced CCT.

11.1 PREPARATION AND PROCESSING

At the conclusion of the LIVES processing periods, the output CCT's will be obtained from the DTL Tape Library. Data Management will prepare a Production Film Converter Work Order (Figure 11.1-1) for each CCT to be run. The CCT's will be submitted for PFC processing to obtain imagery from the front, middle, and end of each tape. All CCT's will be returned to the DTL Tape Library for archiving at the completion of this process.

11.2 DATA QUALITY VERIFICATION

The output products obtained from the PFC will be reviewed by Data Management to ensure that the processing request has been appropriately satisfied. These products will be provided to the Analyst Interpreter section for data quality review and analysis. The basis of that analysis being the determination of obtaining the correct location and quality of image. This will provide the basis for further AgRISTARS related processing and analysis.

12.0 DATA BASE MANAGEMENT

This section defines the activities that take place relative to LIVES data base updates, maintenance, and modifications.

12.1 DATA BASE UPDATES

Most updating of the data base is accomplished through the processing of the various LIVES run cycles. However, Data Management may interactively delete scenes which contain 100 percent cloud cover.

12.2 DATA BASE MAINTENANCE

The processes performed here include a data base packing activity and an inactive file removal activity.

Data base packing will occur on a weekly basis. This is accomplished to facilitate more efficient use of disk space. It eliminates blank areas on the disk where records may have been deleted or otherwise not used. Inactive file removal will be performed on a far more infrequent and long term basis. A review of files on record in the data base will be performed to determine inactive candidates. Once these have been identified, they will be off loaded from the active disk to magnetic tape or disk. This data, whenever needed again at a later time, may be recalled and loaded to the active data base as required. Due to the expected growth of the data base, this mechanism will provide more efficient use of disk space, a more manageable size data base, and a minimization of LIVES run cycle processing time requirements.

12.3 DATA BASE MODIFICATIONS

Modifications and/or changes to any part of the LIVES data base will be requested through the Software Development Section and coordinated with the

configuration management elements. These changes may include field definitions, field sizes, field formats, record types, or other structure modifications.

12.4 DATA BASE BACK-UP AND RECOVERY

A back-up copy of the most recent LIVES Master Data Base will be obtained on a weekly basis, or more frequently, dependent upon the level of LIVES processing which is taking place. This will be the responsibility of the Data Base Manager. This action will provide the capability to reconstruct the data base, from some reasonable past point in time, in the event that a catastrophic loss of data should occur on the active operational version of the LIVES data base.